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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/976,720	10/12/2001	Shoab A. Khan	0037203-6	2476

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EXAMINER

KANG, INSUN

ART UNIT	PAPER NUMBER
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2124

DATE MAILED: 09/10/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

09/976,720

Applicant(s)

KHAN ET AL.

Examiner

Insun Kang

Art Unit

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 12 February 2002 and 12 October 2001.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1 and 2 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1 and 2 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 12 October 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 0
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

### DETAILED ACTION

1. This action is responding to application papers dated 2/12/2002 and 10/12/2001.
2. Claims 1-2 are pending in the application.

### ***Claim Rejections - 35 USC § 112***

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter, which the applicant regards as his invention.

4. Claims 1 and 2 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Per claim 1, the scope of the word "preparing" is unclear whether it is a step of actually creating a flow graph or a data-gathering step to create the flow graph. The formal is considered for interpretation.

As per claim 2, this claim is rejected for dependency on the above rejected parent claim 1.

5. Claim 1 is rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential steps, such omission amounting to a gap between the steps. See MPEP § 2172.01. The omitted steps are: the steps of preparing a flow graph as the claim recites, "preparing for said algorithm a flow graph."

As per claim 2, this claim is rejected for dependency on the above rejected parent claim 1.

***Claim Rejections - 35 USC § 101***

6. 35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

7. Claims 1 and 2 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.

Claims 1 and 2 are non-statutory because they are directed to a “method” without recitation of a computer or a computer-readable medium embodying the method. The claims merely recite a “method” that is disembodied arrangement so as to be called a “computer program” or compilation of facts, information, or data *per se*, without creating any functional interrelationship, either as part of the stored data or as part of the computing processes performed by the computer (“acts”) or computer readable medium so as to enable the computer to perform the claimed steps of preparing...a glow graph, transforming the flow graph, determining a minimum iteration period, etc as recited.

Thus the claims represent non-functional descriptive material that is not capable of producing a useful result, and hence represent only abstract ideas. Therefore, the claims are non-statutory.

***Claim Rejections - 35 USC § 102***

8. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

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(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

9. Claims 1 and 2 are rejected under 35 U.S.C. 102(b) as being anticipated by Walker et al. ("Introduction to the Scheduling Problem," IEEE, 1995) hereinafter referred to as "Walker."

Per claim 1:

Walker discloses:

- preparing for said algorithm a flow graph wherein each computation operation appears as a separate node, and a plurality of edges represents data dependencies between the separate nodes ("In CDFG, nodes represent operations in the behavioral description, such as additions and multiplications. Edges represent values—inputs to the expression, temporary results, and the output of the expression... conditional branches, loops, and so forth—hence the name control/data-flow graph," page 60 third column; "there is a data dependency between the two operations... We represent this data dependency during the synthesis process as a precedence constraint between the two operations, which the control step schedule must satisfy," page 61 first column)
- transforming the flow graph into machine-readable data for use in an integer linear program, wherein the data expresses equations and constraints associated with the optimal iteration period of the algorithm implemented on a processor having a plurality of types of functional units ("we may want to find one that is optimal with respect to some objective function... we need to know the type of the functional unit allocated to each operation, we can compute the overall functional

unit area as the sum of the areas of the maximum number of functional units of each type used in any one control step,” page 61, first column; “We can now use these constraints to construct ILP formulations representing the various scheduling problems... Given these formulations, a commercial ILP solver can produce an optimal solution,” page 68 first column)

- determining a minimum iteration period for completion of the computation operations by computing an optimal solution to the integer linear program as a solution of its corresponding linear constraints, and scheduling the computation operations according to the optimal solution provided by the integer linear program (“We can now use these constraints to construct ILP formulations representing the various scheduling problems... Given these formulations, a commercial ILP solver can produce an optimal solution,” page 68 first column ) as claimed.

Per claim 2:

The rejection of claim 1 is incorporated, and further, Walker teaches:

- the minimum iteration period is derived by minimizing an objective function in relation to a plurality of operation precedent constraints, job completion constraints, iteration period constraints and functional unit constraints (“ILP problems are problems that... minimize some objective function of many variables, subject to linear equality and inequality constraints, and integrality restrictions on all of the variables,” page 67 first column) as claimed.

10. Claims 1 and 2 are rejected under 35 U.S.C. 102(b) as being anticipated by Munch et al. (An Efficient ILP-Based Scheduling Algorithm for Control-Dominated VHDL Descriptions, ACM, 1997) hereinafter referred to as "Munch."

Per claim 1:

Munch discloses:

- preparing for said algorithm a flow graph wherein each computation operation appears as a separate node, and a plurality of edges represents data dependencies between the separate nodes ("For internal representation the VHDL specification is mapped onto two graph structure: a weighted control/dataflow graph...and a flow graph...all other statements are represented by nodes...Edges...represent data flow," page 350 section 3.5 Graph Model; "If there is a data dependence from a node u to a node v," page 354 4.1.2 Dataflow Constraints)
- transforming the flow graph into machine-readable data for use in an integer linear program, wherein the data expresses equations and constraints associated with the optimal iteration period of the algorithm implemented on a processor having a plurality of types of functional units (section 4.1 The ILP model; "We have presented an ILP formulation to solve the scheduling problem in control-flow dominated behavioral descriptions," page 362 conclusion)
- determining a minimum iteration period for completion of the computation operations by computing an optimal solution to the integer linear program as a



solution of its corresponding linear constraints, and scheduling the computation operations according to the optimal solution provided by the integer linear program ("we thus arrive at an integer linear programming problem... ILP-based approaches are especially powerful because they permit implementation of a wide variety of optimizations by reformulating the objective function," page 357 4.3 Objective Function; "Given a solution to the ILP problem, we now have to translate this into the code transformation yielding the optimized VHDL description," page 359 , 5. Derivation of the Optimized Automation) as claimed.

Per claim 2:

The rejection of claim 1 is incorporated, and further, Munch teaches:

- the minimum iteration period is derived by minimizing an objective function in relation to a plurality of operation precedent constraints, job completion constraints, iteration period constraints and functional unit constraints ("the minimum number of wait-statements will be generated from a set ...using the objective," page 356 section 4.3 Objective Functions) as claimed.

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Insun Kang whose telephone number is 703-305-6465. The examiner can normally be reached on M-F 8:30-5:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kakali Chaki can be reached on 703-305-9662. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

IK

9/3/2004

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